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Is Bilingualism a Benefit in Recovery from Aphasia?

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This study was undertaken after intensive rehabilitation with a bilingual individual who recovered from severe aphasia. At the time of her injury she spoke both English and Mandarin Chinese. Bilingualism for this individual involved a tonal and non tonal language which is hypothesized to be beneficial in her recovery. Psycholinguistic research in bilingualism proposes that at the conceptual-semantic level these two languages may be overlapping but that the lexical level representations are non-overlapping; this is particularly the case for Mandarin and English. Mandarin Chinese is a language that requires tonal changes to indicate meaningful differences in words. Although the research is not unequivocal, lateralization of Mandarin Chinese is partially supported in the right hemisphere. We studied the connectivity of language areas activated by Mandarin and English in a bilingual individual, CL, with aphasia. This individual's language recovery was remarkable given her extensive LIFC damage. We hypothesized that language substrates that supported Mandarin and were undamaged in the right hemisphere helped to facilitate her recovery of English.

We asked:

1. What, if any, suggestion can be made for the benefit of bilingualism in the recovery from aphasia in this individual?

2. On a language-based fMRI experiment with both English and Mandarin components, are the regions associated with English and Mandarin after the onset of aphasia overlapping or non-overlapping?

Procedures

CL participated in an intensive verb intervention for six months. Her scores on the Western Aphasia Battery improved from an Aphasia Quotient (AQ) of 48.3 to an AQ of 79.8, from a Broca's to Anomic aphasia. An imaging study was designed post hoc to address the possible contribution of Mandarin Chinese to her recovery of English. Conditions imaged under fMRI were: "Match Object", "Match Voice" and verb generation, each in both Mandarin and English. Match object was a description of an object and after a delay the object or a foil was read. The participant used a button press to agree or disagree that the description matched the object. Match voice was the control condition whereby the participant used a button to decide if after a delay the voices matched.

Analysis/Results

The fMRI experiments revealed extensive right hemisphere activation associated with both English and Mandarin processing(see Figure). Rows 1 and 2- Activation (language:English/Chinese vs. Control) based on multiple analysis from the first (Row 1) and second (Row 2) run of the object-matching task. Rows 3 and 4 - Language activation

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based on ICA from the first (Row 3) and second (Row 4) run of the object-matching task.

Conclusions

In this bilingual individual imaging revealed primarily right hemisphere activation for both Mandarin Chinese and English. It is likely that CL utilized these right hemisphere substrates that were already receptive to linguistic input prior to her injury. Our results support our hypothesis that the bi-hemispheric substrates supporting Mandarin Chinese were a benefit to CL as she regained English. This research may lend support to the benefit of bilingualism in the recovery from aphasia.